Book Review

Protoplast Fusion. Genetic Engineering in Higher Plants

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Most of the progress in the hybridization of somatic cells (parasexual hybridization) of higher plants has been achieved through the efforts of plant physiologists. However, as pointed out by the authors, 'further qualitative improvement in this field is inconceivable without the instillation of genetic ideology and the strict logic of genetic experiments'. Hence, the main purpose of this book is an attempt to organize the available experimental data in terms of genetic analysis.

The first part is a discussion of techniques for producing parasexual hybrids, including culture methods for isolated protoplasts, protoplast and subprotoplast fusion, uptake of isolated organelles and problems of genetic variability associated with the *in vitro* manipulation of plant cells. This is followed by a consideration of the analysis of the hybridization process and the genetic composition of the plants arising from protoplast fusion. Such fusions and the subsequent regeneration of plants may result in a number of complications and problems. Some examples are: changes in chromosome number and structure, production of chimaeras, fusions involving more than two cells, and heterokaryons in which nuclear fusion has not taken place. Various methods for testing and interpreting the results of parasexual hybridization are described, together with their advantages, disadvantages and possible pitfalls which have to be considered.

The rest of the book deals with the genetics and uses of parasexual hybridization in crosses of closely and distantly related plants. Protoplast fusion provides opportunities for the production of novel hybrid plants with combinations of parental genes that are either unobtainable, or else not readily obtained by conventional sexual crossing. Examples are plants which are heterozygous for extranuclear (plastid and mitochondrial) genes, plants with a nucleus from one parent and cytoplasm from the other, and plants that have some extranuclear genes (e.g. the plastid genes) from one parent and the rest from the other parent. Such plants may be used for basic genetic studies of both nuclear and extranuclear genes and mechanisms of differentiation and morphogenesis. In addition, they could be of practical value in breeding programmes, for the modification of cytoplasmic genomes and for the transfer of desirable genes from one species to another where hybridization by sexual crossing is impossible.

The book is well-written, although there are some typographical and grammatical errors. The figures are of good quality and there are useful tables listing species, together with references, which have been used for protoplast culture and fusion.

Because it represents a genetic point of view and because of the critical manner in which the authors evaluate experiments and the data obtained, this book should be very useful to persons working in the field of higher plant protoplast fusion.

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